ASE4423/6423 – Introduction to Computational Fluid Dynamics

Spring Semester 2013
Sec. 01, MWF 9:00-9:50am
Walker 304

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Textbook: John C. Tannehill, Dale A. Anderson, and Richard H. Pletcher, *Computational Fluid Mechanics and Heat Transfer*, second edition, Taylor and Francis, 1997. (TAP)

Reference: Current literature

Office hours*	Monday	Tuesday	Wednesday	Thursday	Friday
Walker 319C	TBA	TBA	TBA	TBA	TBA

*Available other times by appointment

Catalog Data: ASE 4423/6423. Introduction to Computational Fluid Dynamics. (3) (Prerequisite: Consent of Instructor). Three hours lecture. Elementary aspects of computational fluid dynamics (CFD); review of numerical analysis as pertinent to CFD; numerical solution to selected fluid dynamic problems.

Prerequisites by Topic:

1. Fluid Mechanics (EM 3313)
2. Numerical Methods (MA 3313, or MA 5313 and MA 5323)

Course Outcomes:

1. Demonstrate knowledge of model equations for the development of numerical solution algorithms
2. Demonstrate knowledge of the elementary aspects of computational fluid dynamics including; difference equations, order of accuracy, stability, consistency, convergence, upwinding, explicit and implicit methods, boundary conditions, etc.
3. Demonstrate the ability to perform detailed analysis of numerical algorithms
4. Demonstrate the ability to recognize the physical and numerical fluid behavior within a numerical solution
5. Demonstrate the ability to describe numerical solutions to model problems including an assessment of solution accuracy
6. Demonstrate the ability to utilize relevant literature in computational fluid dynamics

Topics:	Source
Introduction	None
ODE solution methods	Handout
Introduction to partial differential equations	TAP 2.1-2.4
Finite difference approximations	TAP 3.1-3.4
Stability analysis	TAP 3.6
Linear wave equation	TAP 4.1
Nonlinear wave equation	TAP 4.4
Heat equation	TAP 4.2
Laplace equation	TAP 4.3
Verification and validation	Handouts
“Real CFD”	Handout and demo

Grades:

Homework	20%	Homework, projects, and a few in-class exercises will be assigned throughout the semester. Quizzes will be given at appropriate times. The standard 10-point scale will be used to assign a letter grade.
Project	10%	
Quizzes	40%	
Final Exam	30%	

Course Policies:

1. Course notes, handouts, and assignments will be available via WebCT. Point your browser toward http://courses.webct.msstate.edu and login using your NetID and NetPassword. Then select "Int Comput Fluid Dyn (ASE-4423-01)" or "Int Comput Fluid Dyn (ASE-6423-01)" oe "Int Comput Fluid Dyn (ASE-6423-501)" as appropriate.
2. Your grades will be available in the WebCT grade book. Please check your grades periodically to ensure that they have been properly recorded.
3. I will use your official university email address to communicate with you. It is your responsibility to check this email address for information relating to the class.
4. If you miss class for any reason, you are responsible for all material covered that day.
5. If you miss one test, the comprehensive final exam will be used as the make up test. You will receive a grade of zero on any tests missed beyond the first.
6. Homework will consist of assignments that will be collected and graded. The homework assignments are for your benefit since they provide you an opportunity to master the course material. "In class" work will consist of occasional problems worked in class and turned in for a grade. No late homework will be accepted.
7. While I encourage you to work together, any graded material must be your own work unless I tell you otherwise. The MSU Honor Code states:

   > "As a Mississippi State University student, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do."

   Any occurrences of academic misconduct will be dealt with in accordance with MSU policy as described in the Honor Code http://www.honorcode.msstate.edu/.